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Technology for Drug Development to Eradicate HIV/AIDS

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Technology for Drug Development to Eradicate HIV/AIDS

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Worldwide 36.9 million people live with HIV; 2.6 million are children under the age of 15. There is still no cure for HIV, but effective treatment with antiretroviral drugs can control the virus so that patients with HIV reduce the risk of virus transmission while enjoying healthy lives. Our laboratory seeks to design targeted drugs that reverse HIV latency; enabling the immune system to identify and destroy HIV-infected cells. One promising therapeutic strategy is to activate the latent reservoirs of HIV within infected T-cells. The viral production will directly induce cell death, leading to the eradication of HIV/AIDS within patients.

To achieve this goal, we are developing bryostatin, a powerful activator of Protein Kinase C (PKC), as a method to reverse HIV latency. PKC activation is a common pathway that upregulates HIV expression. Bryostatin 1, a specific PKC activator, increases virus production. Viral reactivation performed in combination with HAART, which suppresses HIV replication, would help eradicate latent viral reservoirs while simultaneously depleting the active virus, essentially curing infected patients.

The goal of this research is to enhance a NMR DNP probe to increase the sensitivity and resolution of our solid-state NMR experiments in order to enhance our ability to design derivatives of Bryostatin that more effectively activate HIV. A drastic gain in sensitivity will allow us to determine biomolecular structure of molecules, such as PKC, with less than a milligram of sample. Through enhanced visualization of the biomolecular structure of PKC, we will be able to develop better Bryostatin analogs that can selectively activate different pathways downstream of PKC known to drive HIV activation, allowing us to more effectively reverse HIV latency and thus help rid patients of HIV.